

# GCSE Biology

## Common Mistakes - and How to Avoid Them

AQA Biology (8461)

GCSE

16 mistakes fixed

The mistakes that lose the most marks in **GCSE Biology (AQA)** - the ones examiners report year after year. For each: what students do wrong, the correct method step by step, and the one habit that stops you making it again. Read the fix, not just the error.

### MISTAKE 1 Confusing diffusion, osmosis and active transport

#### WHAT STUDENTS DO

Students say 'osmosis is the movement of particles from high to low concentration' or use the word 'osmosis' for sugar and ions, then lose the definition mark.

#### DO THIS INSTEAD

**1.** State osmosis is specifically the movement of WATER molecules. **2.** Say it goes from a dilute solution (high water concentration) to a more concentrated one (low water concentration). **3.** Add that it happens across a partially permeable membrane and is passive (no energy). **4.** Reserve 'active transport' for movement AGAINST the gradient using energy from respiration.

#### HOW TO AVOID IT

› Memorise the trigger words: osmosis = water, active transport = against gradient + energy.

### MISTAKE 2 Magnification calculations with mixed units

#### WHAT STUDENTS DO

Students put image and object sizes into  $M = I / O$  in different units (mm and  $\mu\text{m}$ ), or forget to rearrange, giving an answer thousands of times out.

#### DO THIS INSTEAD

**1.** Write the formula triangle: magnification = image size / object size. **2.** Convert BOTH measurements to the same unit first ( $1 \text{ mm} = 1000 \mu\text{m}$ ). **3.** Substitute the numbers and divide. **4.** Magnification has NO units; if asked for real size, rearrange to object = image / magnification.

#### HOW TO AVOID IT

› Always convert to the same unit before dividing, and remember magnification is just a number.

### MISTAKE 3 Describing enzyme action without 'active site' and 'specific'

#### WHAT STUDENTS DO

Students say the enzyme 'fits the substrate' but omit that it is the active site, that it is complementary, and that each enzyme is specific to one substrate.

#### DO THIS INSTEAD

**1.** Name the active site as the part the substrate binds to. **2.** State the substrate is complementary to the active site shape (lock and key). **3.** Explain this makes each enzyme specific to one substrate. **4.** If denatured, say the active site CHANGES SHAPE so the substrate no longer fits.

#### HOW TO AVOID IT

› Use the phrase 'active site changes shape' for denaturing, never 'the enzyme is killed'.

**MISTAKE 4** Saying enzymes are 'killed' at high temperature

**WHAT STUDENTS DO** Students write that enzymes 'die' or are 'killed' above the optimum, which scores zero because enzymes are not alive.

**DO THIS INSTEAD** **1.** State that rising temperature first increases rate (more collisions). **2.** Above the optimum, bonds holding the enzyme's shape break. **3.** Say the active site changes shape and is denatured. **4.** Conclude the substrate can no longer bind so rate falls.

**HOW TO AVOID IT** › Replace 'killed' with 'denatured - active site changes shape' every time.

**MISTAKE 5** Food test colours mixed up

**WHAT STUDENTS DO** Students swap the Benedict's and Biuret results, or forget that Benedict's must be heated, losing easy marks.

**DO THIS INSTEAD** **1.** Starch: add iodine solution, positive = blue-black. **2.** Reducing sugar: add Benedict's and HEAT in a water bath, positive = brick-red. **3.** Protein: add Biuret solution (no heat), positive = purple/lilac. **4.** Lipid: add ethanol then water (emulsion test), positive = cloudy white.

**HOW TO AVOID IT** › Learn 'Benedict's needs a bath' - it is the only food test that must be heated.

**MISTAKE 6** Photosynthesis and respiration word equations reversed

**WHAT STUDENTS DO** Students write carbon dioxide + water on the wrong side, or muddle the photosynthesis and aerobic respiration equations.

**DO THIS INSTEAD** **1.** Photosynthesis: carbon dioxide + water → glucose + oxygen (needs light energy). **2.** Aerobic respiration: glucose + oxygen → carbon dioxide + water (releases energy). **3.** Check they are reverses of each other for the reactants and products. **4.** Label photosynthesis as endothermic and respiration as exothermic.

**HOW TO AVOID IT** › Remember respiration is the reverse of photosynthesis - if one is right, flip it for the other.

**MISTAKE 7** Limiting factors graph not interpreted as a plateau

**WHAT STUDENTS DO** Students say increasing light 'always increases' the rate, ignoring that the line levels off when another factor becomes limiting.

**DO THIS INSTEAD** **1.** Describe the rising part: as light increases, rate increases. **2.** Identify where the line flattens (the plateau). **3.** State that at the plateau light is no longer the limiting factor. **4.** Name a new limiting factor: CO<sub>2</sub> concentration or temperature.

**HOW TO AVOID IT** › On any rate graph, always name what becomes limiting once the line plateaus.

**MISTAKE 8** Mitosis and meiosis confused

**WHAT STUDENTS DO** Students say mitosis makes gametes, or that meiosis produces identical cells, mixing up the two divisions.

**DO THIS INSTEAD** **1.** Mitosis: makes 2 genetically IDENTICAL diploid cells for growth and repair. **2.** Meiosis: makes 4 genetically DIFFERENT haploid gametes (sex cells). **3.** Note meiosis halves the chromosome number; mitosis keeps it the same. **4.** Match the process to the context: growth/repair = mitosis, gametes = meiosis.

**HOW TO AVOID IT** › Meiosis = makes gametes, halves chromosomes, gives variation (four M words to recall).

**MISTAKE 9 Genetic cross / Punnett square missing the ratio**

|                         |                                                                                                                                                                                                                                                                                                                                               |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WHAT STUDENTS DO</b> | Students fill the Punnett square but forget to state the phenotype ratio or probability, or use lower-case for a dominant allele.                                                                                                                                                                                                             |
| <b>DO THIS INSTEAD</b>  | <b>1.</b> Choose clear symbols: capital for dominant, same letter lower-case for recessive. <b>2.</b> Write the parents' genotypes and split into separate gametes. <b>3.</b> Draw the 2x2 grid and combine the alleles in each box. <b>4.</b> Count the phenotypes and give the ratio (e.g. 3:1) or probability as a fraction or percentage. |
| <b>HOW TO AVOID IT</b>  | › Never stop at the grid - always write the phenotype ratio or probability the question asks for.                                                                                                                                                                                                                                             |

**MISTAKE 10 Antibiotics described as killing viruses**

|                         |                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WHAT STUDENTS DO</b> | Students claim antibiotics cure colds or flu, but antibiotics only kill bacteria, not viruses.                                                                                                                                                                                                                                  |
| <b>DO THIS INSTEAD</b>  | <b>1.</b> State antibiotics kill bacteria or stop them reproducing. <b>2.</b> Explain they do NOT work on viruses because viruses live inside cells. <b>3.</b> Say painkillers only treat symptoms, they do not kill any pathogen. <b>4.</b> Link resistance to overuse: bacteria with resistant alleles survive and reproduce. |
| <b>HOW TO AVOID IT</b>  | › Antibiotics = bacteria only; if the disease is viral, antibiotics will never be the answer.                                                                                                                                                                                                                                   |

**MISTAKE 11 Negative feedback in homeostasis described vaguely**

|                         |                                                                                                                                                                                                                                                                                                     |
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| <b>WHAT STUDENTS DO</b> | Students say the body 'fixes' blood glucose without naming the hormone, the organ, or the direction of change.                                                                                                                                                                                      |
| <b>DO THIS INSTEAD</b>  | <b>1.</b> State the receptor detects the change from the set point. <b>2.</b> Name the organ: the pancreas detects blood glucose. <b>3.</b> High glucose -> insulin released -> liver stores glucose as glycogen. <b>4.</b> Low glucose -> glucagon released -> glycogen converted back to glucose. |
| <b>HOW TO AVOID IT</b>  | › For glucose control, always pair insulin with 'stores as glycogen' and glucagon with 'releases glucose'.                                                                                                                                                                                          |

**MISTAKE 12 Reflex arc missing relay neurone or naming order wrong**

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| <b>WHAT STUDENTS DO</b> | Students leave out the relay neurone or write motor before sensory, breaking the pathway and losing sequence marks.                                                                                                                                                         |
| <b>DO THIS INSTEAD</b>  | <b>1.</b> Stimulus detected by a receptor. <b>2.</b> Sensory neurone carries the impulse to the central nervous system. <b>3.</b> Relay neurone passes it across the spinal cord. <b>4.</b> Motor neurone carries it to the effector (muscle or gland) to cause a response. |
| <b>HOW TO AVOID IT</b>  | › Memorise the order: receptor, sensory, relay, motor, effector - and never skip the relay.                                                                                                                                                                                 |

**MISTAKE 13 Confusing 'gene', 'allele' and 'chromosome'**

|                         |                                                                                                                                                                                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WHAT STUDENTS DO</b> | Students use these words interchangeably, e.g. calling an allele a 'gene' or saying chromosomes carry one gene.                                                                                                                                       |
| <b>DO THIS INSTEAD</b>  | <b>1.</b> Chromosome = a long thread of DNA carrying many genes. <b>2.</b> Gene = a section of DNA coding for one protein. <b>3.</b> Allele = a different version of the same gene. <b>4.</b> Use the right word for the scale the question is about. |
| <b>HOW TO AVOID IT</b>  | › Think nested boxes: chromosome contains genes, a gene has alleles.                                                                                                                                                                                  |

**MISTAKE 14 Sampling with a quadrat - no mean or no area scaling****WHAT STUDENTS DO**

Students count one quadrat and quote that as the population, or forget to scale up from the sampled area to the whole field.

**DO THIS INSTEAD**

**1.** Place quadrats randomly using a number generator for coordinates. **2.** Count the organisms in each quadrat and record several readings. **3.** Calculate the MEAN number per quadrat. **4.** Multiply mean per quadrat by the total area / quadrat area to estimate the population.

**HOW TO AVOID IT**

› Always take a mean from several quadrats, then scale by total area before stating a population.

**MISTAKE 15 Mark scheme wants comparative language for data****WHAT STUDENTS DO**

In AQA 6-mark questions students describe each result in isolation instead of comparing, missing 'higher than' / 'compared to' marks.

**DO THIS INSTEAD**

**1.** Read both data sets before writing. **2.** Quote a value from each and use a comparative word (higher, lower, faster). **3.** Include a manipulated figure, e.g. 'twice as much' or 'increased by 12'. **4.** Link the comparison back to the biology the question is testing.

**HOW TO AVOID IT**

› In extended answers, always compare with numbers - 'X is higher than Y by Z'.

**MISTAKE 16 Required practical variables not controlled****WHAT STUDENTS DO**

Students name only one variable to keep the same, or confuse the independent and dependent variable in a method.

**DO THIS INSTEAD**

**1.** Identify the independent variable (the one you change). **2.** Identify the dependent variable (the one you measure). **3.** List at least two control variables to keep the same for a fair test. **4.** Mention repeats and a mean to improve reliability.

**HOW TO AVOID IT**

› Label IV, DV and at least two control variables explicitly in every method answer.